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Nesting of House Sparrow *Passer domesticus* (LINNAEUS, 1758)

[Pp. 231—250, pls. VI—VII and 5 text-figs]

Gnieżdżenie się wróbla *Passer domesticus* (LINNAEUS, 1758)

Гнездование домового воробья *Passer domesticus* (LINNAEUS, 1758)

Abstract. This paper deals with the nesting of the House Sparrow on the basis of observations of 271 nests, mainly from South Poland. The situation (height and type of site), shape, and size of the nests, which the authors have classified in several groups according to the conditions of the site, as well as the material used for nest building, are discussed in succession. Great adaptive capabilities of the House Sparrow in respect of nesting are demonstrated and its nest construction is compared with that in other species of the family *Ploceidae*.

I. INTRODUCTION

In the present study the authors have attempted to define the construction of nests of the House Sparrow *Passer domesticus* (LINNAEUS, 1758), to find the characters the nests from different environments have in common, which characters might be regarded as typical of the nests of this species, and to show the adaptive capabilities of the House Sparrow for nesting in very different environmental conditions. In the available ornithological literature there are no publications dealing with the whole problem of nesting of the House Sparrow in detail. We have found only general descriptions or notes restricted to particular questions.

II. MATERIAL AND METHOD

Material for the present work was collected in the Kraków, Katowice, Rzeszów and partly Kielce Districts in 1963—1966. Each of the nests we found was examined separately. Its environment, situation, and height above the ground were noted down and, where it was possible to examine a nest at close quarters or to take it away, its shape, measurements and material were recorded.

A total of 271 nests were examined. They were obtained from environments which, in general, may be divided into three groups:

1. Rural environment. — It is characterized by the presence of farmsteads with low and detached farm-houses and other farm buildings, situated in the vicinty of cultivated fields or, at times, woods. This environment is represented by 51 nests from Cieszyn Silesia, the region at the foot of the Carpathians, the Kraków-Wieluń Jurassic Ridge and the Kielce District.

2. Suburban environment. — This environment includes relatively loosely built-up areas, in which villa type houses predominate; it abounds in gardens and greens. The material of 148 nests from this environment was collected in the outskirts of Kraków, Skoczów and Łańcut.

3. Urban environment. — Attached houses, scarcity of green and open areas, heavy traffic, etc. are typical of this environment. Seventy-two nests obtained from this environment were collected in Kraków, Nowa Huta, Bielsko-Biała and Skoczów.

III. NEST-SITE

The House Sparrow is an eminently synanthropic bird and it nests in all environments, as often as not in the close vicinity of man, choosing, however, diverse places for its nest. Five main types of nest-sites may be distinguished in our material. This fact indicates great capabilities of the species to adapt to different environments. Diagrams of the five-types of nest-sites are shown in Fig. 1. These types are:

I. Nests on rafters under roofs of houses. Three variants of this type of nest-sites have been established according to local conditions:

a. nests on rafters in the ridge part of the roof,
b. nests on rafters in the middle part of the roof, and
c. nests on rafters in the eaves part of the roof.

II. Nests in crevices in walls, hollows left after bricks or mortar, cracks and holes in rocks, tree-holes and nesting-boxes. A general characteristic of this type of nest-sites is that the nests are placed in a limited space, closed at least on three sides. This type, again, has three variants:

a. nests in hollows after bricks, gaps in walls, recesses for lamps, etc.,

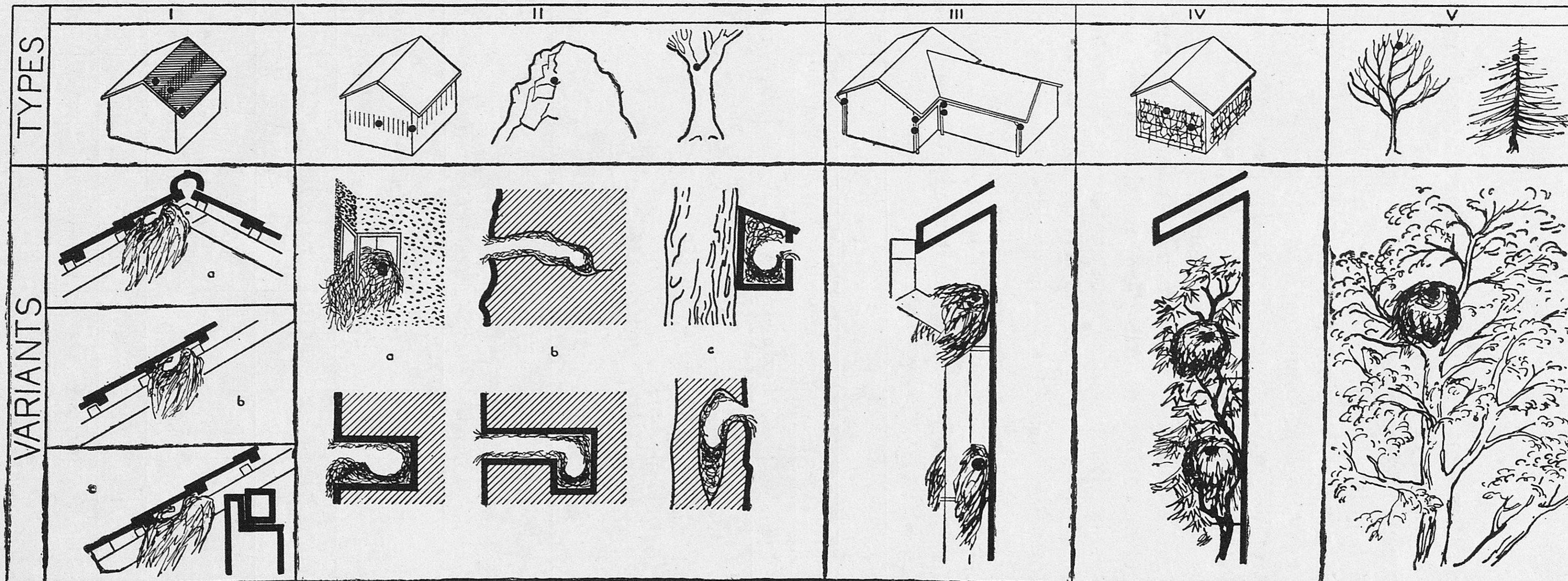


Fig. 1. Types and variants of nest-sites of the House Sparrow. The order corresponds to that in Table I. Type I — on rafters. Type II — in holes and crevices in rocks, walls and trees. Type III — behind gutter-spouts. Type IV — in creepers on walls. Type V — among tree branches.

b. nests in crevices left after mortar and other building materials have crumbled away, in vents and in cracks of rocks, and
c. nests in tree-holes and nesting-boxes.

III. Nests behind a gutter-spout.

IV. Nests in wall creepers (Virginia creeper, ivy).

V. Free-standing nests in tree branches.

In the distinction of particular types of nest-sites we based ourselves only on the nature of the place in which a nest was situated, that is, the set of characters that made up the definite conditions for nesting. Hence, e. g., Type II includes nests in rather diverse environments, such as crevices and holes in walls, tree-holes and nesting-boxes. All these nests, however, were affected by similar factors, which conditioned, among other things, the manner of building and the nature of construction. The numbers of nests representing different types and variants for particular environments are given in Table I.

Table I

Comparison of the numbers of nests in particular types and variants of nest-sites in different environments

Type od nests	Variant	Environment						Total	
		Rural		Suburban		Urban			
		number	%	number	%	number	%	number	%
I on rafter	a top	2	3.92	4	2.70	2	2.77	8	2.95
	b middle	3	5.88	15	10.13			18	6.64
	c eaves	19	37.28	29	19.54	4	5.93	52	19.18
II in holes and crevices	a	4	7.84	11	7.43	6	8.33	21	6.75
	b	3	5.88	8	5.40			11	4.06
	c	4	7.84	17	11.46	8	11.11	29	10.80
III behind gutter spout				12	8.22	29	40.27	41	15.12
IV in creepers		1	1.96	49	33.10	22	30.25	72	26.49
V among branches of trees		10	19.60					10	3.69
Others		5	9.80	3	2.02	1	1.34	9	3.32
Total		51	100.00	148	100.00	72	100.00	271	100.00

As will be seen from an analysis of the particular environments, the nests placed on rafters (Type I) predominate in the rural environment, 47.08%, which is particularly true of the eaves variant. The nests situated in holes and crevices (Type II) come second, 21.56%. In the suburban environment the most numerous nests are those in creepers (Type IV), 33.10%, but their predominance is caused by the inclusion of the data from two large colonies in this table. In fact, this type of nest-sites is not so numerously represented in the suburban environment and, as in the rural environment, the nests on rafters (32.37%) and those in holes and crevices (24.29%) are characteristic of it. In the urban environment the commonest nest-sites represent Type III, behind a gutter spout (40.27%). The nests in creepers come second in number (30.25%) and those in crevices and hollows in walls third (19.44%). The summation of the data from these three environments shows that the nests on rafters (Type I) are the most numerous and form 28.77% of all the nests we found.In spite of the three variants distinguished above, this type is relatively uniform in respect of the nature of the places in which nests are situated and it seems to be the most characteristic of the rural and suburban environments. On the contrary, Type II (22.61% of the total of nests found), which also splits into three variants, is immensely differentiated in so far as environmental conditions are concerned and represents a wide range of adaptive capabilities of the House Sparrow for nesting in diverse places fit for this purpose. Out of the other types of nest-sites, those among branches of trees, though rarely met with, are worthy of note. Ten nests of this type were found, which makes 3.69% of the total material, all of them in a rural environment in the Kielce District. The only other record of this mode of nesting in Poland has been obtained by letter from Mag. L. Tomiałojć (outskirts of Legnica and Wrocław). We have received another record of the occurrence of this type of nests in Moravia (Czechoslovakia) by oral communication from Dr. Z. Bocheński. It is noteworthy that these nests (some dozens in number) were sited in roadside trees among the fields, a long way from human abodes. In literature the data concerning the free-standing nests of the House Sparrow among the branches of trees have been presented by Barlov (1966), Bourne (1953), Busse (1964), Greve (1958), Haensel (1966), Novikov et. al. (1963), Popov (1962), Summers-Smith (1963) and Taczanowski (1862). Novikov et. al. (1963) state that in the environs of Moscow House Sparrows build their first nests of the breeding-season under roofs and in different holes and crevices, whereas the next ones may occur in the crowns of trees.

Among the 271 nests found, 9 cannot be numbered in any of the basic types and have been defined as exceptions (others). These are the nests of House Sparrows found on steel girders inside factory buildings (1 nest), in nests of the House Martin (4 nests), in nests of the Fieldfare (1 nest), in nests of the Chaffinch (1 nest), inside wooden balcony brackets (1 nest) and behind a national emblem on a building (1 nest).

These cases are not, however, isolated, as many descriptions of such uncom-

mon nest-sites of House Sparrows can be found in literature. There are comparatively numerous instances of nesting of House Sparrows in the nests of other birds, such as Swallows (Popov, 1962; Summers-Smith, 1963), different species of Crow birds (Greve, 1958; Summers-Smith, 1963), Storks (Summers-Smith, 1963) different birds of prey (Morejohn, 1953; Summers-Smith, 1963) and Wood Pigeons (Barloy, 1966). In addition, Summers-Smith (1963) writes about the nesting of House Sparrows in the partly remodelled nests of Thrushes, Chaffinches as well as in the holes of Sand Martins and Kingfishers. In south-east Asia, colonies of House Sparrows have been found nesting in burrows, in the loess walls of gorges and in the steep banks of rivers (Popov, 1962). However, the author does not explain whether they were holes abandoned by other species (swallows or small mammals) or whether they were excavated by House Sparrows. A similar phenomenon of colonial nesting in cliff crevices and rock holes has been reported by Summers-Smith (1963) from Iceland and the Glasgow region, and Sudhaus (1957) from northern Norway. As curiosities, Barloy (1966) mentions a House Sparrow's nest built between two electric conductors (15 cm apart) and another placed on the sill outside a window; Bridgman (1962) describes the nesting of these birds in aeroplanes, unused for a long time and designed for repair. A hollow excavated for the nest by a House Sparrow in the trunk of an old tree (Philipson, 1938) is also a curious instance.

The height of nest-sites above the ground shows relatively great fluctuations, which range from 1.5 m to 13 m. The data for the particular environments

Table II

Heighsts of sites of 271 nests of House Sparrow in different environments

Height groups, in m.	Rural		Suburban		Urban		Total	
	No. of nests	%	No. of nests	%	No. of nests	%	No. of nests	%
0— 0.99								
1.0— 1.99			3	2.02			3	1.11
2.0— 2.99			22	14.86			22	8.12
3.0— 3.99	6	11.76	30	20.27	8	11.11	44	16.24
4.0— 4.99	22	43.14	16	10.85	9	12.50	47	17.34
5.0— 5.99	15	29.41	23	15.54	12	16.67	50	18.45
6.0— 6.99	7	13.73	19	12.83	10	13.89	36	13.28
7.0— 7.99	1	1.96	13	8.78	12	16.67	26	9.59
8.0— 8.99			15	10.13	3	4.17	18	6.64
9.0— 9.99			2	1.35	13	18.05	15	5.57
10.0—10.99			1	0.67	2	2.78	3	1.11
11.0—11.99			2	1.35	1	1.38	3	1.11
12.0—12.99			2	1.35	2	2.78	4	1.48
Total	51	100.00	148	100.00	72	100.00	271	100.00

and their comparison are presented in Table II. It will be seen from this table that in the rural environment most of the nests are built at heights of 4—4·99 m and 5·0—5·99 m (43·14% and 29·41%, respectively). The suburban environment shows preference for nests at a height from 3·0 to 3·99 m (20·77%) and most of the nests (about 75%) are under 7 m. On the other hand, this environment is characterized by a very wide distribution of heights of nest-sites. In the urban environment the numbers of nests within particular height groups are more or less uniformly distributed from 3 to 10 m.

A comparison of totals from the three environments shows that a greater part of the nests belong to the height groups 3·0—3·99 m (16·24%), 4·0—4·99 m (17·34%, and 5·0—5·99 m (18·49%). The nests situated below 3 m and above 7 m constitute a decided minority of the total od nests found, there being more nests placed at greater heights than 7 m than those below 3 m. According to the data presented by Summers-Smith (1963), the House Sparrow most frequently nests 3 m and more from the ground, though exceptionally there occur nests at a height of some dozen centimetres above the ground. The heights of nest-sites examined by Barloy (1966) in Paris and its environs range from 4 to 10 m, and Popov (1962) gives the mean height equal to 10 m for the nests on branches of trees.

IV. SHAPE AND SIZE OF NESTS

The nest of the House Sparrow is a more or less regular spherical mass, whose shape and size are to a great extent dependent on the conditions of the site. The common characters of all its nests are the spherical or semispherical shape, the presence of a dome covering the nest from above, the clearly defined nest-cup and the entrance passage. All these characters, except for the nest-cup, which is always well delimited, vary in distinctness, which allows the classification of nests in four groups. The groups differ rather remarkably in structure.

Group I. It includes most of the nests placed on rafters (Type I, variants a and b). They have a relatively long entrance passage (15 cm and more), a flattened and almost elliptical shape, and a poorly developed dome. The slight difference between the height and the depth, with a comparatively great width, is a characteristic of this group. Some nests situated on rafters in the eaves part of roofs (variant c) differ from the previous ones in their smaller length of entrance passage (from 5 to 15 cm). Some of the nests in crevices and holes (Type II, variant b), in which the structure is determined by similar site conditions, can also be numbered in this group.

Group II. This group consists of most of the nests placed in crevices and holes (Type II, variants b and c). Their entrance passage ranges between 5 cm and 15 cm in length, and the dome is moderately well developed. The nests of this group approximate to a sphere in shape, but show an inclination towards

an elongation in the vertical axis, and hence the height is the greatest of all their dimensions.

Group III. It contains nests built in recesses and gaps in walls, in hollows left after bricks, as well as those placed behind gutter-spouts (Type II, variant a, and Type III). These nests have a very short — if any at all — entrance passage, a spherical shape, and a well-developed dome. If a nest has been used for several breeding-seasons, it usually has a greater height, because it has been systematically extended. In the nests constructed behind a gutter-spout the height is generally greater than in the remaining nests of the group, though their depth remains unchanged. This difference in height is due to the increase in the thickness of the bottom layer of the nest, which again results from the fact that the nest sited behind a spout has no solid base to rest on and so a large part of it is suspended in the air, its main points of support being at the sides.

Group IV. This group consists of nests in creepers and tree branches. They have the shape of a sphere and an opening in the upper half of the side wall. The entrance passage is very short, corresponding to the thickness of the wall, and the solid dome forms a compact whole with the rest of the nest. These nests are better constructed and more massive than those of the previous groups.

Studying the nesting of House Sparrows in the rural environment, Novotny (1965) distinguished three types of nests on the basis of similar criteria. According to his data, the nests which might be numbered in our group III were the most numerous in this environment.

In order to define the shape and size of nests we measured the outer and inner diameters, as well as the height and the depth of nest (Fig. 2). The two

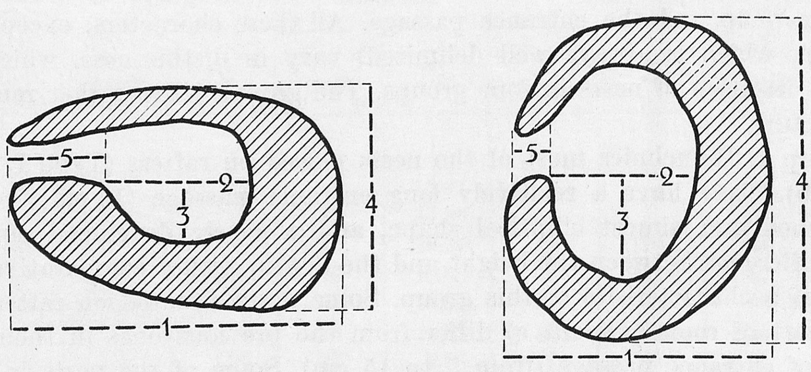


Fig. 2. Sections of different nests of the House Sparrow, illustrating the methods od measuring, 1 — outer diameter, 2 — inner diameter (diameter of nest-cup), 3 — depth, 4 — height. 5 — length of entrance passage

diameters were measured twice, and in the case of an elliptical or irregular shape, these measurements were the shortest and the longest diameter. The arithmetic means obtained from these two measurements were used for all

Table III

Dimensions of nests of House Sparrow

	No. of nests	Measurements	Arithmetic mean $\tilde{x}$	Standard deviation δ	Coefficient of variation ν
Outer diameter	26	17.0—23.5	21.3	2.22	10.42
Inner diameter	26	6.0—12.0	8.9	0.66	7.50
Height	24	14.0—31.0	21.9	1.29	5.89
Depth	26	5.0— 8.0	6.4	0.93	14.60

calculations. When taking measurements, we often encountered great difficulties, because some nests were hard of access, or on account of their loose structure, which made it impossible for us to remove them undamaged or to take their exact measurements. Consequently, we managed to take only 26 full measurements and, as far as the height of nest is concerned, only 24. The measurements are offered in Table III. Besides, the distribution of the inner diameters and depths of the nests examined has been presented in the form of diagrams (Figs. 3 and 4). As will be seen from our calculations, the inner diameter (arithemtic mean being 8·9 cm with standard deviation equal to 0·66) and the depth (arithmetic mean — 6·4 cm, standard deviation — 0·93) are the most characteristic measurements of the House Sparrow's nest. These measurements define the nest-cup, which in this nest is always very distinct and made of material that does not undergo any deformations.

The height and outer diameter of nests are for the most part governed by the size (capacity) of the nest-site, and for this reasonthe particular measurements vary rather considerably from each other and the standard de-

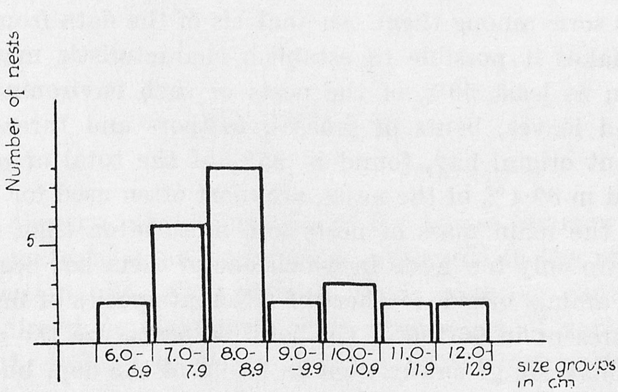


Fig. 3. Distribution of the mean diameters of nest cup of the House Sparrow = 26 nests

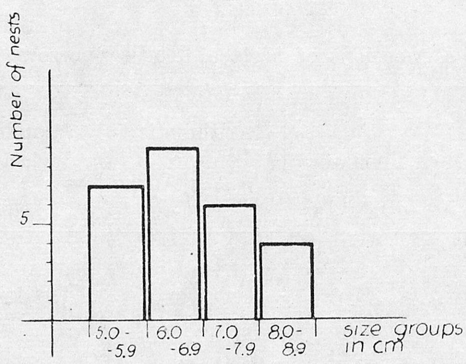


Fig. 4. Distribution of the depth of 24 nets of the House Ssparrow

viation is greater than the mean (2·22 for the outer diameter and 1·29 for the height). The weights of nests taken for 55 specimens throw some light upon their size and the amount of building material used (Fig. 5). The fluctuations in weight are very great and range from 4 to 33 dkg. (arithmetic mean being 16 dkg). These data confirm the results obtained by Barloy (1966), who gives the weights ranging from 3·9 to 27·5 dkg., most frequently between 10 and 15 dkg. Still higher values may be found in literature, e. g., Makatsch (1957) mentions a nest weighing 61 dkg.

V. NEST MATERIAL

Ninety-six nests have been studied in respect of material used to build them. The results of these analyses are shown in Table IV.

The House Sparrow uses very diverse nest material, which, in general, can be divided into natural and artificial materials. Natural materials include elements of plant and animal origin, those derived from plants being much more differentiated (19 sorts of plant materials, 6 sorts od animal materials). Artificial materials are also much differentiated, since we managed to distinguish 16 various sorts among them. An analysis of the data from the particular environments makes it possible to establish characteristic materials, that is, such as occur in at least 50% of the nests of each environment. These are: hay, straw, dead leaves, bents of grasses, feathers and threads. Out of the materials of plant origin, hay, found in 95% of the total of nests examined, and straw, found in 89·4% of the nests, are most often used for building. These materials make the main mass of nests and more often than not occur both together; there are only few nests in which one of them has been used. Among the materials of animal origin, feathers of different species of birds, but mostly of hens, being present in 96·7% of the total of nests, are the commonest element here. Feathers are generally used as lining of the cup, but also to build the nest walls. In the few nests in which feathers are wanting they are replaced by down. Burrage (1964) describes nests in which dandelion down was used

instead of feathers and down of birds. The number of feathers in a nest may be imposing; for instance, SUMMERS-SMITH (1963) mentions 200 to 300 eathersf as an average, but their number may come to 1200 in exceptional cases. Analysing a nest, BARLOY (1966), too, found 590 feathers in it. Another frequent element of nest material are different kinds of threads, ascertained in 77·8% of the nests examined. They make very good material used by the House Sparrow to fasten up the nest construction. As to artificial materials, such as pieces of paper, cloth, thread, tissue paper, etc., their variegation is striking. Yellow, violet, white, red and blue pieces were encountered. This may be referred to the analogous phenomenon described in Tree Sparrows as a „need for embellishment" of nests by EISENHUT & LUTZ (1936). However, CREUTZ (1948), who also deals with this problem in the Tree Sparrow, states that there is no purposefulness in this behaviour of the bird; it simply picks up the material that catches its eye most.

It should be added that the House Sparrow's nest material varies consider ably in siz eand shape. The length of particular pieces of straw and hay ranges between 5 and 75 cm and pieces of string, which are rather often found in nests, reach 60 cm in length. Besides, small tufts of grass with earth among the roots and balls of thread or string are not rare in the nest of this bird.

The wide range of both natural and artificial nest materials is undoubtedly connected with the diversity of environments inhabited by the House Sparrow. It collects material for nest a short distance from the nest-site and does not select it, but is governed by its accessiblity. Hence most of the nests situated near each other, e. g., in an urban courtyard or within a farmstead, are as a rule built of similar materials. The use of building material with such a wide range of characters is connected with great adaptive capabilities of this species. The data concerning the materials used by the House Sparrow to build its nest given by other authors are similar to those found during our investigations (BANNERMAN, 1953; BARLOY, 1966; BURRAGE, 1964; FITTER and RICHARDSON, 1954; GLEGG, 1928/29; ŁĄCKI, 1962; SUMMERS-SMITH, 1963; TACZANOWSKI, 1862; WARDEN, 1950; WILLIAMSON, 1950).

VI. DISCUSSION

The data on the site, shape and size of the House Sparrow's nest, as well as those on the material used for building, presented in the previous sections show great variation and, what follows, great adaptive capabilities of this bird in all the directions mentioned. This wide range of variation makes it, to a great extent, difficult to define the characters which extremely different nests have in common, namely, those associated with the genetically established nest formation characteristic of this species (PROMPTOW, 1945). As Bo-

Table IV

Occurrence od different materials in 95 nests of House Sparrow relative to environment (26 rural, 47 suburban and 22 urban nests)

		Material	Rural		Suburban		Urban		Total	
			No. of nests	%	No. of nests	%	No. of nests	%	No. of nests	%
Natural	Vegetable	hay	25	96.1	46	97.8	20	90.9	91	95.8
		straw	25	96.1	45	95.8	15	68.1	85	89.4
		bents of grasses	22	84.6	33	70.2	10	45.4	65	68.4
		dead leaves	18	69.2	23	44.2	11	50.0	52	54.7
		stalles of weeds	17	65.3	29	61.6	5	22.7	51	53.6
		roots of grass and weeds	15	57.6	32	68.0	3	13.6	50	52.6
		fresh grass	18	69.2	23	44.2	7	31.8	48	50.5
		sticks	8	30.4	20	42.7	13	59.0	41	43.1
		bark	9	34.6	21	44.6	4	18.1	34	35.7
		bast	9	34.6	19	40.4	6	27.2	34	35.7
		twigs	7	26.9	21	44.6	1	4.5	29	30.3
		chaff	13	50.0	9	19.1	4	18.1	26	27.4
		moss	9	34.6	8	17.0	3	13.6	20	20.1
		ears	11	42.3	7	14.6			18	18.9
		chips	4	15.2	12	25.5			16	16.8
		splinter			5	10.6			5	5.2
		green leaves	1	3.8	3	6.3			4	4.2
		flowers			3	6.3			3	3.1
		pods	1	3.8	1	2.1			2	2.1
		earth [1]	3	11.4	5	10.6			8	8.4
	Animal	whole feather	25	96.1	45	95.8	22	100.0	92	96.7
		feather shafts	9	34.6	14	29.2	6	27.2	29	30.5
		down	9	34.6	14	29.2	5	22.7	28	29.4
		hair	12	46.1	12	25.5			24	25.2
		horsehair	2	7.6	4	8.5	3	13.6	9	10.4
		animal fur (with skin)			3	6.3			3	3.1

Artificial	threads	11	41.8	41	87.2	22	100.0	74	77.8
	cotton-wool	6	22.8	26	55.3	15	68.1	47	47.5
	string	5	19.2	23	44.2	7	31.8	35	36.8
	cellulose tissne	2	17.6	17	35 9	11	50.0	30	31.5
	paper	5	19.2	14	29.2	3	13.6	22	23.1
	coloured pieces of cloth	6	22.8	8	17.0	5	22.7	19	20.0
	glass-wool	1	3.8	10	21.3	1	4.5	12	12.6
	fibres of coco-nut matting	1	3.8	7	14.6	2	9.0	10	10.5
	wadding	3	11.4	2	4.2	4	18.1	9	9.4
	tissne paper	2	7.6	3	6.3	1	4.5	6	6.2
	coloured tissne paper			4	8.3	1	4.5	5	5.2
	filter paper					3	13.6	3	3.1
	strap	1	3.8					1	1.1
	insulated wire			1	2.1			1	1.1

[1] Earth is brought into the nests with roots of plants

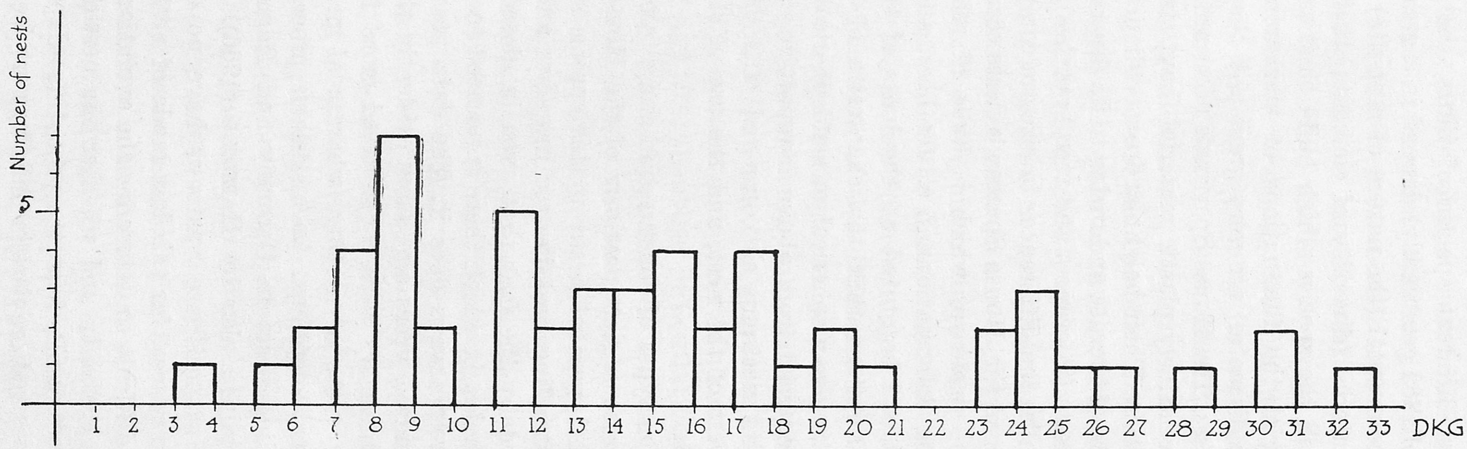


Fig. 5. Weights of material used for building of the nests of House Sparrow

CHEŃSKI (1957, 1961, 1962, 1966) has demonstrated in his papers on the nest ing of different species of birds, the characters of their nests (except those established genetically) depend in a great measure on a number of factors, both environmental (the nature of nest-site) and those connected with the qualities of material (diversity of elements, their elasticity and plasticity). He states that in the species which build their nests of very plastic and scarcely elastic material the fluctuations of measurements, among them also those of the inner diameter, are very great and they still increase with the loose structure of nests. The House Sparrow's nests are for the most part built of hardly elastic and relatively plastic material (hay, straw) and as a rule have a loose construction. Their height and outer diameter are, above all, determined by the nature of the site and owing to its diversity show great variation. In free-standing nests (in crepers and rtee branches), which have a more compact structure of walls, the differences in size are comparlatively small. A fairly constant character of the House Sparrow's nests seems to be the magnitude of the diameter of the nest-cup, which is built of relatively elastic material undergoing no lasting deformations, i. e., feathers, and therefore shows slight fluctuations.

It can be stated on the basis of the results obtained during the present investigations that the characters of the House Sparrow's nests are: their tendency to a spherical or semispherical shape, their being covered with building material from above irrespective of the nature of the site, their relatively distinct nest-cup as compared with the loose and untidy construction of the rest of the nest, and the use of straw, hay and feathers as building materials.

The types of construction and site of nests distinguished in this paper indicate also a gret plasticity of the House Sparrow's nest-building instinct. The original type of nests in this species seems to be represented by a spherical free-standing nest in tree branches and in creepers. This supposition is supported by the fact that even in closed spaces, such as hollows in walls and tree-holes, in which there is no need to protect the nest from above, the House Sparrow always does it. The data presented by TACZANOWSKI (1862) about a hundred years ago show evidently that at that time free-standing nests in tree branches were encountered more frequently in Poland, as often as the other types of nesting, whereas at present such nests are rather numbered among exceptions. An analogous process of reduction of the number of free-standing nests in Germany and Romania in the present century has been ascertained also by HAENSEL (1966). Now nests are built in tree branches only when House Sparrows have no chances to build them in sheltered or closed places, for this last mode of nesting has become typical of this species. It is difficult to determine the evolutionary course of the nest-building instinct for a certainty and whether the nesting in tree-holes, ground holes and rock crevices results from the preceding adaptation of the House Sparrow for nesting in holes and crevices in buildings or vice versa. It is also worth while to consider the cases in which these birds occupy the abandoned nests of other birds, either

in their original form of open nests or remodelling them by building a dome over them. This may be a new step in the evolution of their nest-building instinct, which possibility was also considered by SUMMERS-SMITH (1963).

Among the birds of Central Europe the greatest resemblance in nest construction should be expected in the phylogenetically closest relative of the House Sparrow, belonging to the same genus, i. e., in the Tree Sparrow *Passer montanus*. The Tree Sparrow uses very diverse building material, which is anlogous with that applied by the House Sparrow as far as its qualitative composition and percentile share are concerned (BERCK, 1961; CREUTZ, 1949; EISENHUT and LUTZ, 1936; RUTHKE, 1955; SEEL, 1954; SOKOŁOWSKI, 1958; TACZANOWSKI, 1862). The mode of building, the shape and the outer diameters, as well as the manner in which the nest is placed in its site, are also analogous. Although CAMPBELL (1953), FITTER and RICHARDSON (1954) and NOLL (1959) distinguish the nests of these two species, they give no essential characters which would make it possible to tell them from each other in a decisive manner. In his key to bird nests MIHEYEV (1957) offers the mean dimensions of the nests of House and Tree Sparrows, out of which the inner diameters differ evidently from each other (about 8 cm in the House Sparrow and about 5 cm in the Tree Sparrow). It is however obvious that, as this difference has been found by statistical methods, there will be some, perhaps not very numerous, cases in big series, such that the values of measurements will coincide owing to their wide ranges of variation (cf. Table III). Thus, this character allows the distinction of nests of these two species in most cases, but not in all of them. Some differences in the nesting of House and Tree Sparrows in Central Europe may be found in the localization of nests. To be sure, they do not concern the number and type of variants of nest-sites, but consist in the selection of different breeding biotopes which determine the site of nesting. These differences are, however, due to the fact that the House Sparrow ousts the Tree Sparrow from its places of nesting throughout the area where their ranges overlap (SUMMERS-SMITH, 1963). Wherever there are no House Sparrows or they occur as visiting birds, the Tree Sparrows occupy their breeding biotopes and dwell mainly in human settlements even in central districts of town (FORMOZOV, 1944; SUDILOVSKAYA, 1954; SUMMERS-SMITH, 1963). These data are fully confirmed by the observations of PINOWSKI (1967), who shows that the rural environment is the optimal breeding biotope for the Tree Sparrow and that the farther from human houses, the more rarely this species nests.

Many resemblances in nest construction and site may also been found in other species of the genus *Passer*. BERCK (1961, after BOETTICHER, 1958 and MACKWORTH et al., 1953) writes that *Passer simplex*, *Passer melanurus* and *Passer molitensis* show the same characters in nest site and construction as those in the House and Tree Sparrows. POPOV (1962) describes the nest sites of *Passer hispaniolensis*, which do not differ from those of the species under study. As will be seen from the paper by SOPYEV (1967), the nests of *Passer simplex* much resemble the free-standing nests of House and Tree Spar-

rows. The same may be told about the nest of *Passer rufocinctus*, described by Collias and Collias (1964).

Some analogies in nest construction and shape can be observed in other species of the family *Ploceidae*. The birds of this family build nests of different shapes but always closed from above and with an entrance in the side wall or from below, often furnished with an entrance passage (Crook, 1960; Salim Ali, 1958). Out of the House Sparrow's nests, the free-standing ones in creepers and in branches of trees have a spherical or ovate shape with a side entrance and resemble the nests of other *Ploceidae*. This would be another character supporting the membership of the genus *Passer* in the family *Ploceidae*, for in old literature, as well as in some recent publications, this genus is erroneously referred to the family *Fringilidae* (Bannerman, 1953; Dunajewski and Marchlewski, 1938; Sokołowski, 1958; Taczanowski, 1882).

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REFERENCES

Bannerman D. A., 1953. The Birds of the British Isles, London. **1**.

Barloy J. J., 1966. Recherches sur le moineau domestique *Passer d. domesticus* (Linné) 1758: cycle biologique, ecologie, dynamique de population; sa place dans l'avifaune Parisiene (in print).

Berck K. H., 1961. Beiträge zur Ethologie des Feldsperlings (*Passer montanus*) und dessen Beziehung zum Haussperling (*Passer domesticus*). Vogelwelt, Berlin und München, **82** (5—6): 129—173.

Bocheński Z., 1957. Obserwacje nad umiejscowieniem i budową gniazda u muchołówki szarej *Muscicapa striata* (Pall.) Zesz. Nauk. UJ, Zoologia, Kraków, **2**: 77—83.

Bocheński Z., 1961. Nesting biology of the Black-necked Grebe. Bird Study, Oxford, **8** (1): 6—15.

Bocheński Z., 1962. Nesting of Black-headed Gull *Larus ridibundus* L. Acta zool. cracov., Kraków, **7** (6): 87—120.

Bocheński Z., 1966. Nesting of Common and Black Terns. Acta zool. cracov., Kraków, **11** (14): 421—450.

Bourne W. P. R., 1953. House sparrow enlarging its nesting site. Brit. Birds, London, **46** (10): 381—382.

Bridgman C. J., 1962. Birds Nesting in Aircraft. t. Birds, London, **55** (11): 461—470.

Burrage B. R., 1964. A nesting study of the House Sparrow (*Passer domesticus*) in San Diego Country, California. Trans. Kansas Acad. Sci., Kansas, **67** (4): 693—701.

Busse H., 1964. Der Haussperling (*Passer domestic*pa.) als Freibrüter im Tierpark Berlin. Milu, **1**: 310—317.

Campbell B., 1953. Finding Nests. London.

COLLIAS N. E., COLLIAS E. C., 1964. Evolution of nest-building in tche Weaverbirds(Ploc eidae) Univ. of California Publ. in Zoology, Berkeley and Los Angeles, 73.
CREUTZ, G. 1949. Untersuchungen zur Brutbiologie des Feldsperlings. Zool. Jahrb. Jena. **78** (2): 133—172.
CROOK, J. H. 1960. Nest Form and Construction in Certain West African Weaver-birds. Ibis, London, **102** (1): 1—25.
DUNAJEWSKI, A., MARCHLEWSKI J., 1938. Klucz do oznaczania ptaków Polski. Kraków.
EISENHUT E., LUTZ W., 1936. Beobachtungen über die Fortpflanzungsbiologie des Feldsperlings. Mitt. Vogelw., Stuttgart, **35** (1): 1—14.
FITTER R. S. R., RICHARDSON R. A., 1954. The Pocket Guide to Nests and Eggs. London.
FORMOZOV A. N., 1944. Zametki o ekologii i selskochoziajstwiennom značenii vorobev (*Passer d. bactrianus* ZAR. et KUDASCH. i *Passer m. pallidus* ZAR.) v južnoj Turkmenii. Zool. žurn., Moskva, **23**: 342—350.
GLEGG E., 1928/29. Bark stripping by House Sparrow. Brit. Birds, London, **22**: 159.
GREVE K., 1958. Zum Freibrüten der Haussperlinge (*Passer domesticus*) und des Feldsperlings (*Passer montanus*) auf Neuwerk. Orn. Mitt., Hamburg. **10** (9): 176.
HAENSEL J., 1966. Vergleichende betrachtungen zum Freibrüten der Haussperlinge (*Passer domesticus* L.) in Rumänien und DDR. Trav. Mus. D'hist. Nat., Bucureşti, **6**: 339—344.
ŁĘCKI A., 1962. Obserwacje nad biologią lęgów wróbla domowego. Acta Orn., Warszawa, **6** (12): 195—207.
MIHEYEV A. V., 1957. Opredelitel ptičich gniezd. Moskva.
MAKATSCH W., 1957. Ptak i gniazdo, jajo i pisklę. Warszawa.
MOREJOHN G. V., 1953. English Sparrow nesting within Nest of Red tailed Hawks. Condor, Berkeley, **55** (3): 161—162.
NOLL H., 1959. Bestimmungstabelle für Nester und Eier einheimischer Vögel. Basel.
NOVIKOV G. A., MALČEVSKIJ A. S., OVČINNIKOVA N. P., IVANOVA N. S., 1963. Pticy učleschoza „Les na Vorskle" i jevo okrestnostiej. Voprosy ekol. i biocenol. Moskva. **8**: 9—118.
NOVOTNY J., 1965. Vliv tvaru hnizda na průběh hnizdění u vrabce domáciho (*Passer domesticus*). Zpravy geogr. ústavu ČSAV. Opava. **4** (134-B): 4—8.
PHILIPSON W. R., 1938. House Sparrows excavating nest-hole. Brit. Birds, London, **32**: 17.
POPOV A. V., 1962. Vorobi — vrediteli zernovo choziajstwa v Tadžikistanie i ich istreblenie. Trudy A. N. TadžSSR, Dušanbe, **22**: 26—38.
PINOWSKI J., 1967. Die Auswahl des Brutbiotops beim Feldsperling (*Passer m. montanus* L.). Ekologia pol. A., Warszawa. **15** (1):
PROMPTOV A. N., 1945. Fizjologiczeskij analiz instinkta gniezdostrojenija u ptic. Izw. Akademii Nauk SSSR (ser. biol.), Moskva, **1**: 1—26.
RUTHKE P., 1955. Feldsperling als Freibrüter. Vogelwelt. Berlin und München. **76**(3): 108.
SALIM ALI 1958. The breeding biology of some Indian Weaver Birds (*Ploceidae*: *Ploceinae*). Proc. of the Cent. Congress of Biol., Singapore.
SUMMERS-SMITH D., 1963. The House Sparrow. London.
SEEL D. C., 1964. An analysis of the nest record cards of the Tree Sparrow. Bird Study, Oxford, **11**(4): 265—271.
SOKOŁOWSKI J., 1958. Ptaki ziem polskich. Warszawa.
SOPYEV O., 1965. Pustynnyj vorobej v Kara-kumach. Ornitologija, Moskva, **7**: 134—141.
SUDHAUS W., 1967. Haussperling (*Passer domesticus*) als Felsbrüter in Nordnorvegen. Orn. Mitteil., Hamburg, **19**(1): 20.
SUDILOVSKAYA A. M., 1954. Familia *Ploceidae* (in: Pticy Sovetskogo Sojuza, Moskva. **5**).
TACZANOWSKI W., 1862. Oologia ptaków polskich. Warszawa.
TACZANOWSKI W., 1882. Ptaki krajowe. Warszawa.
WARDEN D., 1950. House Sparrow linning nest with green leaves. Brit. Birds, London, **43**(3): 83—84.
WILLIAMSON W., A. 1950. Nest of House Sparrow. N. Z. Bird Notes, Wellington, **3**(8): 198.

STRESZCZENIE

Autorzy omawiają gnieżdżenie się wróbla *Passer domesticus* na podstawie obserwacji 271 gniazd zebranych w latach 1963—1966 głównie z terenu Polski południowej z trzech różnych środowisk — wiejskiego, podmiejskiego i miejskiego. Kolejno analizowane są: usytuowanie gniazd, kształt i wielkość, materiał i sposób budowy. Na ryc. 1 (str. 233) przedstawionych jest pięć głównych typów usytuowań gniazd. Są to gniazda położone na krokwiach, w szczelinach i dziurach, za rynną, w pnączach ściennych i gniazda wolno stojące w gałęziach drzew. Ilości gniazd przypadających na różne typy i warianty dla poszczególnych środowisk zostały zebrane w tabeli I (str. 234). W środowisku wiejskim dominują gniazda położone na krokwiach — 47, 08%, w podmiejskim gniazda w pnączach — 33,10%, oraz na krokwiach — 32,37%, a w miejskim usytuowane za rynną — 40,27%. W zestawieniu ogólnym najliczniejsze są gniazda na krokwiach, stanowiące 28,77% wszystkich znalezionych gniazd. Wśród znalezionych 271 gniazd 9 nie da się zaliczyć do żadnego z wyróżnionych typów usytuowania i określono je jako wyjątki („inne").

Wysokość położenia gniazd nad ziemią w poszczególnych środowiskach, jak i zestawienie zbiorcze zostały ujęte w tabeli II(str. 236). Wykazują one stosunkowo duże wahania: w granicach od 1,5 do 13 m. W środowisku wiejskim najwięcej gniazd położonych jest w granicach od 4 do 6 m (72,55%). Środowisko podmiejskie charakteryzuje duże zróżnicowanie wysokości umiejscowienia gniazd (znajduje się je we wszystkich wyróżnionych przedziałach wysokości), daje się jednak zauważyć pewna tendencja do umiejscowiania ich w granicach od 3 do 6 m (46, 60%). Dla środowiska miejskiego ilość gniazd przypadająca na poszczególne przedziały wysokości jest mniej więcej równomiernie rozłożona od 3 do 10 m. Ogólnie najwięcej gniazd przypada na wysokości od 3 do 6 m (52,07%). Cechą wspólną wszystkich gniazd jest ich kulisty lub półkulisty kształt, istnienie kopuły przykrywającej gniazdo od góry, zdecydowanie wyodrębniona czasza jajowa i obecność korytarza wlotowego. W zależności od typu umiejscowienia gniazda cechy te (prócz czaszy jajowej, która jest zawsze dobrze wyodrębniona) występują mniej lub bardziej wyraźnie i na tej podstawie autorzy wyróżniają cztery grupy gniazd, różniące się dość znacznie charakterem budowy. W tabeli III (str. 239) zostały przedstawione zebrane i przeliczone wyniki pomiarów 26 gniazd. Wymiary gniazd ulegają znacznym wahaniom: średnica zewnętrzna od 17 do 23,5 cm (średnia arytmetyczna 21,3 cm), średnica wewnętrzna od 6 do 12 cm (średnia arytmetyczna 8,9 cm), wysokość od 14 do 31 cm (średnia arytmetyczna 21,9 cm) i głębokość od 5 do 8 cm (średnia arytmetyczna 6,4 cm). Dodatkowo zostały podane w postaci diagramów rozkłady średnicy wewnętrznej (ryc. 2, str. 238) i głębokości badanych gniazd (ryc. 3, str. 239), jako najbardziej stałe wielkości dla gniazd wróbla. Pomiary wagowe 55 gniazd ilustruje ryc. 4 (str. 240). Wahania są duże: od 4 do 33 dkg (średnia arytmetyczna 16 dkg).

Materiał używany do budowy gniazd wróbla jest bardzo różnorodny (ta-

bela IV, str. 242) i można go ogólnie podzielić na naturalny (pochodzenia roślinnego i zwierzęcego) i sztuczny. Daje się w nim wyróżnić pewną ilość materiałów charakterystycznych, tj. występujących w co najmniej 50% w każdym środowisku. Są to: siano, słoma, suche liście, kwiatostany traw, pióra i nitki. Do najliczniej używanych materiałów należy siano, stwierdzone w 95% wszystkich przebadanych gniazd, słoma w 89, 4% i pióra w 96,7%. Materiał gniazdowy wróbla jest bardzo zróżnicowany pod względem wielkości i kształtu.

W rozdziale poświęconym omówieniu wyników są zebrane i przedyskutowane cechy charakterystyczne dla gnieżdżenia się tego gatunku oraz porównanie ich z danymi innych autorów. Podjęta jest również próba ustalenia pierwotnej formy budowy gniazd wróbla, którą wydają się być gniazda wolno stojące w pnączach i gałęziach drzew. W oparciu o dane z literatury zestawione są cechy charakterystyczne dla budowy i umiejscowienia gniazd mazurka *Passer montanus*, które wykazują ogromne podobieństwo do gniazd wróbla. Różnic należy szukać tylko w wymiarach średnicy wewnętrznej gniazda i jego głębokości. Stwierdzono również duże analogie gniazd rodzaju *Passer* do gniazd gatunków z rodziny *Ploceidae*, które zawsze budują swoje gniazda zamknięte od góry, z otworem wlotowym z boku, często prowadzącym do korytarza wejściowego. Przemawia to dodatkowo za zaliczeniem rodzaju *Passer* do rodziny *Ploceidae*.

РЕЗЮМЕ

Авторы обсуждают гнездование домового воробья *Passer domesticus* на основании наблюдения 271 гнёзд, собраных в 1963—1966 гг., в основном, на территории южной Польши, в трёх различных средах: сельской, пригородной и городской. Поочерёдно проанализировано расположение гнёзд, их форму и величину, строительный материал и способ строения. На фиг. 1 (стр. 233) представлено пять главных типов расположения гнёзд. Гнёзда эти размещены на стропах, в щелях и дырах, за водосточными трубами, в лианах, вьющихся по стенам, а также гнёзда свободно построеные на ветках деревьев. В таблице I (стр. 234) собрано количества гнёзд, приходящихся на различные типы и варианты для каждой среды. В деревне доминируют гнёзда, расположенные на стропах — 47,08%, в пригороде —гнёзда в лианах — 33,10% и на стропах — 32,37%, а в городе за водосточными трубами — 40,27%. В общем сопоставлении, самые многочисленные — это гнёзда на стропах, составляющие 28,77% всех найденных гнёзд. Среди 271 гнёзд 9 нельзя было отнести ни к одному из выделенных типов расположения гнёзд, их засчитано, как исключения („другие").

Высоту расположения гнёзд над землёй в отдельных средах и общее их сопоставление представлено в таблице II (стр. 236). Они показывают довольно значительные колебания, от 1,5 до 13 м. В деревне найболее гнёзд расположено на

высоте от 4 до 6 м (72,55%). Пригород характеризуется большой дифференциацией высоты расположения гнёзд. Их находят во всех выделенных интервалах высоты. Отмечается, однако, тенденция к расположению гнёзд на высоте от 3 до 6 м (46,60%). Количество гнёзд, припадающее на отдельные интервалы высоты, для городской среды, разложено более менее равномерно от 3 до 10 м. В общем, найболее гнёзд находится на высоте от 3 до 6 м (52,07%).

Общим признаком для всех гнёзд является их круглая или полукруглая форма, существование купола, прикрывающего гнездо сверху, обособленный лоток и присутствие входного корридора. В зависимости от типа расположения гнезда эти признаки (кроме лотка, который всегда хорошо обособлён) выступают более или менее отчётливо и на этом основании авторы отличают четыре группы гнёзд, различающихся, в значительной степени, характером их строения. В таблице III (стр. 239) представлено собранные и пересчитанные результаты измерений 26 гнёзд. Размеры этих гнёзд значительно колеблются, а именно: внешний диаметр от 17 до 23,5 см (среднее арифметическое 21,3 см), внутренний диаметр от 6 до 12 см (среднее арифметическое 8,9 см), высота от 14 до 31 см (среднее арифметическое 21,9 см) и глубина от 5 до 8 см (среднее арифметическое 6,4 см). Кроме этого, в виде диаграмм подано разложения внутреннего диаметра (фиг. 2, стр. 238) и глубины исследуемых гнёзд (фиг. 3, стр. 239), как найболее постоянные величины для гнёзд домового воробья. Результаты взвешиваний 55 гнёзд иллюстрирует фиг. 4 (стр. 240). Отклонения большие: от 40 до 330 грамм (среднее арифметическое 160 грамм).

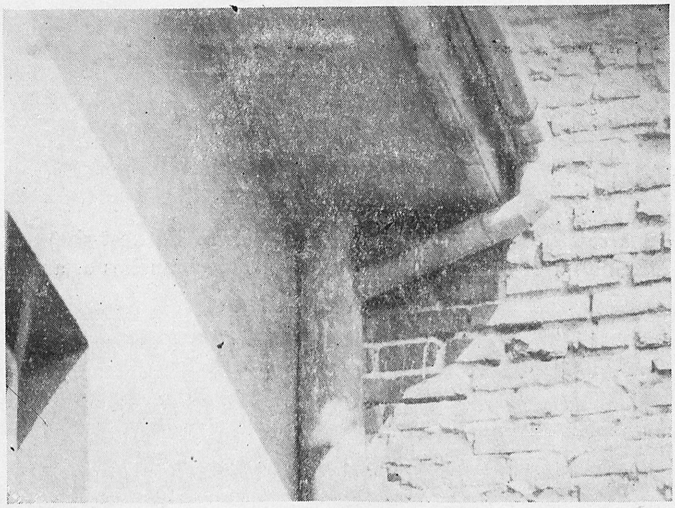
Используемый материал к постройке гнезда домового воробья является очень неоднородным (табл. IV, стр. 242) и можно его разделить на естественный (растительного или животного происхождения) и искусственный. В нём можно различить некоторое количество характерных материалов, то есть, входящих в состав, по крайней мере, 50% гнёзд, в каждой среде. Это — сено, солома, сухие листья, соцветия трав, перья и нитки. К найболее часто употребляемым строительным материалам принадлежат: сено (констатировано у 95% всех исследованных гнёзд), солома у 89,4% и перья у 96,7%. Материал, употребляемый на строение гнезда домового воробья, очень разнообразен в отношении величины и формы.

В главе, посвящённой обсуждению итогов, собраны и продискутированы характерные признаки для гнездования этого вида, а также сравнение их с данными других авторов. Сделано также попытку установления первичной формы строения гнезда у домового воробья. Эту форму, кажется, напоминают гнёзда построенные в лианах и на ветках деревьев. На основании данных из литературы составлено характерные признаки для строения и локализации гнёзд полевого воробья, которые при сравнении с признаками гнёзд домового воробья оказывают огромное сходство. Разниц следует искать только в размерах внутреннего диаметра гнезда и его глубины. Подтверждено также, что между гнёздами рода *Passer* и гнёздами видов из семейства *Ploceidae* имеются большие сходства. Виды из семейства *Ploceidae* всегда строят свои гнёзда закрытыми сверху, из входным отверстием сбоку, часто ведущим к входному корридору. Это ещё один из фактов, который стоит за засчитанием рода *Passer* к семейству *Ploceidae*.

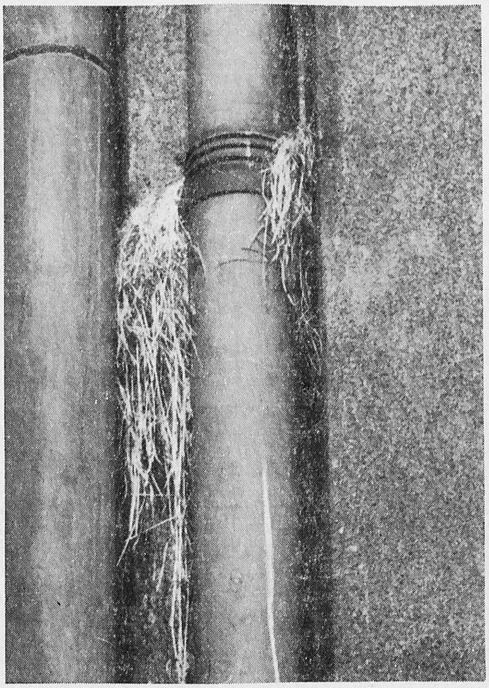
PLATES

Plate VI

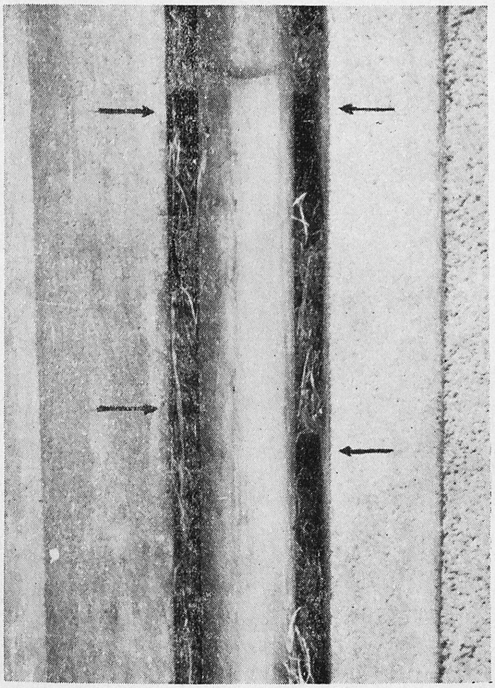
Phot. 1. House Sparrow nest on a gutter-spout (Type III nest-site)
Phot. 2. House Sparrow nest behind a gutter-spout (Type III nest-site)
Phot. 3. House Sparrow nests behind a gutter-spout, showing their „tier" arrangement (Type III nest-site). Arrows indicate the entrance openings of particular nests.



Phot. 1



Phot. 2

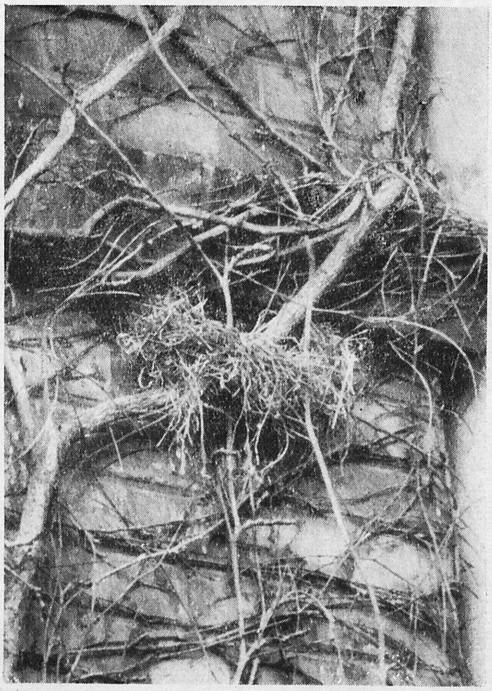


Phot. 3

A. Kulczycki
Phot. author

Plate VII

Phot. 4. House Sparrow nest in a Victoria creeper (Type IV nest-site)
Phot. 5. A free standing nest of the House Sparrow in the branches of an apple-tree (Type V nest-site).



Phot. 4



Phot. 5

A. Kulczycki
Phot. author

Redaktor zeszytu: dr Z. Bocheński

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